What Is Claime

1. A method for use in determining whether a wireless station in a wireless telecommunication system is located within a predetermined area of interest that is of substantially any shape, the method comprising:

receiving a location associated with a wireless station;

providing a quadtree representation of an area that includes a predetermined area of interest; and

using said location associated with a wireless station and said quadtree representation to determine whether the wireless station is located within the predetermined area of interest.

2. A method, as claimed in claim 1, wherein said quadtree representation includes:

level-1 through level- n, where n is an integer;

wherein level-1 has at least one level-1 node that represents a level-1 area;

wherein associated with each level-1 node is a level-1 location;

wherein level-x, where $1<x\leq n$, has a maximum of four level-x nodes for each level-(x-1) node;

wherein each level-x node represents one of the four subsidiary areas of a level-(x-1) area associated with one of the level-(x-1) nodes;

wherein associated with each level-x node is a level-x location;

wherein associated with each level-n node is an indicator of whether or not the level-n area represented by the level-n node is part of the predetermined area of interest.

3. A method, as claimed in Claim 2, wherein said step of using includes:

setting x equal to 1;

first identifying the level-1 node that represents the level-1 area that includes the location associated with the wireless station as the relevant level-x node;

comparing said location associated with a wireless station to a level-x location associated with the relevant level-x node, where $1\leq x<n$, to determine which level-(x+1)

node represents [redacted] level-(x+1) area that includes the [redacted]ion associated with the wireless station;

second identifying the level-(x+1) node determined to represent the level-(x+1) area that includes the location associated with the wireless station as the relevant level-x node;

incrementing, following said step of comparing, the value of x by 1;

repeating, if x<n, said steps of comparing, second identifying and incrementing;

transmitting , if x=n, the indicator associated with the level-n node that indicates whether or not the location of the wireless stations is within the predetermined area of interest.

4. A method, as claimed in Claim 3, wherein said step of comparing includes:

determining whether the latitude of said location associated with a wireless station is greater than or less than the latitude associated with said level-x location;

determining whether the longitude of said location associated with a wireless station is greater than or less than the longitude associated with said level-x location.

5. A method, as claimed in Claim 1, wherein said quadtree representation includes:

level-1 through level- n, where n is an integer;

wherein level-1 has at least one level-1 node that represents a level-1 area;

wherein associated with each level-1 node is a level-1 location;

wherein level-x, where $1<x\leq n$, has a number of level-x nodes that is a multiple of four, where the multiplier is a value from 0 to the number of level-(x-1) nodes;

wherein each level-x node represents one of the four subsidiary areas of a level-(x-1) area associated with one of the level-(x-1) nodes;

wherein associated with each level-x node is a level-x location;

wherein associated with each level-n node is an indicator of whether or not the level-n area represented by the level-n node is part of the predetermined area of interest.

6. [redacted]ethod, as claimed in Claim 5, wherein [redacted] step of using includes:

setting x equal to 1;

first identifying the level-1 node that represents the level-1 area that includes the location associated with the wireless station as the relevant level-x node;

comparing said location associated with a wireless station to a level-x location associated with the relevant level-x node, where $1 \leq x < n$, to determine which level-(x+1) node represents the level-(x+1) area that includes the location associated with the wireless station;

second identifying the level-(x+1) node determined to represent the level-(x+1) area that includes the location associated with the wireless station as the relevant level-x node;

incrementing, following said step of comparing, the value of x by 1;

repeating, if $x < n$, said steps of comparing, second identifying and incrementing;

transmitting , if $x = n$, the indicator associated with the level-n node that indicates whether or not the location of the wireless stations is within the predetermined area of interest.

7. A method, as claimed in Claim 6, wherein said step of comparing includes:

determining whether the latitude of said location associated with a wireless station is greater than or less than the latitude associated with said level-x location;

determining whether the longitude of said location associated with a wireless station is greater than or less than the longitude associated with said level-x location.

8. A method, as claimed in Claim 2, wherein said step of providing a quadtree includes;

storing a level of said quadtree on a disk drive

9. A method, as claimed in Claim 1, further comprising:

inserting a second node to replace an existing, first node;

wherein said second node has either removed or inserted an indicator relative to the existing first, node;

removing following said step of inserting, said existing, first node.

10. A method for constructing a quadtree representation of an area that includes an area of interest and is suitable for use in high-speed, wireless telecommunication application that requires a determination of whether a location associated with a wireless station is within the area of interest, the method comprising:

receiving a map of an area of interest in a telecommunication application;

vectorizing the boundaries of the area of interest to define a polygon defined by a plurality of edges that enclose an area;

establishing a quadtree level depth n, where n is an integer;

setting x equal to 1;

identifying a level-1 node that represents a level-1 area that includes the polygon;

defining, if an edge of said polygon is located within a level-(x+1) area that is one of four subsidiary areas of said level-x area, as a level-(x+1) node;

incrementing the value of x by 1;

repeating, if x<n, said steps of defining and incrementing;

establishing, if x=n, an indicator for each level-n node that identifies the polygon;

wherein said identifier can subsequently be used to determine if the location associated with a wireless station is within said polygon.

11. A method, as claimed in Claim 10, wherein said step of establishing includes:

determining if four nodes at level-n that represent the four subsidiary areas of a level-(n-1) area have the indicator;

establishing, if all four nodes at level-n have the indicator, the indicator in the level-(n-1) node that has the level-(n-1) area that includes the four subsidiary areas associated with the four nodes at level n; and

removing, if all four nodes at level-n have the indicator, the four nodes at level-n from the quadtree.

12. A method, as claimed in Claim 11, wherein said step of establishing includes:

repeating said steps of determining, removing and establishing for all the groups of four nodes at level-n that represent four subsidiary areas of a level-(n-1) area that have the indicator.

13. A method, as claimed in Claim 12, wherein said step of establishing includes:

repeating said step of determining, removing and establishing for each level.

14. A method, as claimed in Claim 10, wherein said step of establishing includes:

setting x equal to n;

determining for all groups of four nodes at level-x that represent the four subsidiary areas of a level-(x-1) area if all four nodes of a group have the indicator;

establishing, for all groups of four nodes have the indicator, the indicator in the level-(x-1) node that has the level-(x-1) area that includes the four subsidiary areas associated with the four nodes at level x;

removing, for all groups of four nodes that have the indicator, the four nodes in each group from the quadtree; and

decrementing x by 1;

repeating, if $x \geq 1$, said steps of determining, removing and establishing.

15. A method, as claimed in Claim 10, further comprising:

inserting a second node to replace an existing, first node;

wherein said second node has either removed or inserted an indicator relative to the existing first, node;

removing, following said step of inserting, said existing, first node.

16. A method for determining whether a wireless station is located within a predetermined area of interest that is of substantially any shape, the method comprising:

transmitting a location associated with a wireless station;

receiving an indication of whether or not the location associated with the wireless station is within a predetermined area of interest based upon using said location associated with the wireless station and a quadtree representation of an area that includes said area of interest to determine if said location associated with a wireless station is within said area of interest.